

Hydatid disease in which man acts the part of intermediate host to a very minute tape worm of the dog is comparatively common in some countries. In the Shetland Isles, for instance, where the dog is very much one of the family in confined accommodation, hydatid disease is, I believe, not rare. I read once that in Glasgow hospitals in abdominal troubles in natives of Shetland the possibility of hydatid disease is always borne in mind.

The obvious methods of control are the destruction of all organs in slaughter-houses showing the least sign of hydatid disease. Dogs should be excluded from slaughter-houses, and anthelmintic treatment of dogs should be adopted where possible.

Trichinosis, which has an ancient history going back probably to the Hebrew prohibition of pork, promulgated by Moses about 1500 B.C., is continually being recorded in other countries where the adequate cooking which is the rule in this country does not obtain. A recent annotation in the "Lancet" dealt with the examination of three hundred human diaphragms, of which forty-one were positive for trichinosis. Fortunately we have no trichinosis problem in this country and, as I said, our system of cooking has to be thanked for that.

## Recent Fractures of the Upper End of the Tibia

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THE importance of fractures at the upper end of the tibia has only recently been brought to the notice of the medical profession, mainly through the startling increase in road accidents in the past ten years.

Their importance is due to the fact that they all involve the knee-joint, and they present to-day one of the biggest groups of knee-joint injuries necessitating in-patient hospital treatment.

In a consecutive series of 106 cases of injury round the knee-joint which I had the opportunity of treating whilst in the Manchester Municipal Service, thirty-one cases were fractures of the tibial head; i.e., twenty-eight per cent. of the whole. In the same series there were :—

- 21 cases of semilunar cartilage injury.
- 20 „ „ fractured patella.
- 9 „ „ tears of the tibial collateral ligament.
- 11 „ „ osteo-arthritis hæmarthrosis.
- 5 „ „ fracture of the lower end of the femur into the joint.
- 2 „ „ ruptured cruciate ligaments.
- 1 „ „ osteo-chondritis dissecans.
- 1 „ „ traumatised pedunculated pad of fat.
- 5 „ „ which did not fit in with any well-defined lesion.

Whilst tibial head fractures may be produced by indirect violence, such as falls on the feet, much more commonly they occur as a result of direct violence. Fractures of this latter type have become so commonly associated with motor-car injury, that Cotton and Berg in 1929 applied to them the expressive name of "bumper and fender fractures." They defined it as a crushing injury produced by abduction of the leg forcibly enough to smash the external tuberosity of the tibia against the fulcrum of the lateral condyle of the femur.

A large percentage of their cases was due to the impact of the front car bumper against the lower leg of pedestrians, and usually the lateral tuberosity of the tibia was the part fractured.

In 1935, Clarke, of Manchester, before the Royal Society of Medicine, stated that two-thirds of the cases he had examined were produced by collisions between motor-cars and pedestrians.

Within the past five years, however, attempts to improve riding comfort and to increase the speed of cars have led to a lowering of the height of the chasses, as a result of which the "bumper injury" more frequently involves the tibial shaft than the upper end. This is well borne out in the present series.

Moore, in 1937, analysed a series of road accidents occurring along the Southend by-pass road near Ilford, and showed that the upper end of the tibia was seldom injured, but that severe comminuted fractures of the mid-shaft of the tibia and fibula were increasingly common.

Dyas and Goren, of Chicago, in a recent paper on bumper and fender fractures, have emphasised the significance of the lowering of the height of car bumpers, and point out that they will strike the legs of pedestrians some distance below the tibial head.

I have measured the height of the front bumper in thirteen different types of car in common use to-day, and find that the average is  $15\frac{1}{4}$  inches. This varies from  $13\frac{1}{2}$  in. in the Standard 10 to 17 in. in the Wolseley 18, Morris 12, and Morris 8.

I have also measured the height above the ground of the upper end of the tibial head when ordinary outdoor shoes are worn, and find that it is  $19\frac{1}{2}$  in. in males (average height of the residents of the Royal Victoria Hospital), and  $18\frac{1}{2}$  in. in females (average height of the nurses of the Royal Victoria Hospital).

It would, therefore, appear that the car bumpers will strike the legs of pedestrians between three and four inches below the upper end of the tibial head, thus sparing the tuberosities and injuring the upper part of the shaft of the bone.

In the present series of thirty-one cases, whilst direct violence was the cause in all, only eleven, or thirty per cent., were the result of the bumper injury. Of these eleven, seven, or 63 per cent., occurred in females. The remaining cases (twenty) were due to:—

Falling down steps	...	...	...	...	...	...	5 cases
Works injuries	...	...	...	...	...	...	9 cases
Kick by horse	...	...	...	...	...	...	2 cases

Striking knee against running-board of tramcar ... ..	2 cases
Kick during football match ... ..	1 case
Fall from chair on to kitchen floor ... ..	1 case

Fractures of the tibial head are best classified in the following three groups :—

1. Fractures of the intercondylic eminence (sometimes called tibial spine).
2. Fractures of the tibial tubercle.
3. Fractures of the tibial tuberosities.

#### FRACTURES OF THE INTERCONDYLIC EMINENCE.

There were four cases in this group; all were males, with an average age of 28 years. The fractured portion of the eminence was found on X-ray examination to be displaced upwards and tilted backwards into the joint, and formed an appreciable bony block to full extension of the joint. There was an associated hæmarthrosis in each case. The treatment employed was :—

1. Aspiration of the hæmarthrosis and injection of 10 c.c. two per cent. novocaine into the joint.
  2. Replacement of the bony fragment into the intercondylic groove by forcibly extending the knee-joint under anæsthesia.
  3. Immobilisation of the limb in a long leg plaster of paris cast for seven weeks.
- There were no complications in these cases, and the average period of disability was fourteen weeks, at the end of which time the knees had almost full range of movement and were completely stable, and painless.

#### FRACTURES OF THE TIBIAL TUBERCLE.

There was only one case of this type of fracture in the present series. It occurred in a boy of twenty-two years who had sustained a direct kick on the upper end of the tibia during a football match.

The fractured portion of bone was triangular in shape, and consisted of the front part of the intercondylic eminence along with the anterior aspect of the mid-portion of the tibial head containing the tubercle. This portion of bone had been displaced upwards by the action of the ligamentum patellæ. Hæmarthrosis was again present.

The treatment employed was practically the same as for the first group, but the limb was kept immobile in plaster of paris for twelve weeks. Almost complete reduction of the fractured portion was obtained, but when last seen, this case had still some limitation of full extension. I feel sure that, had an operative reposition of the fragment been carried out, an excellent result would have been the outcome.

In this connection, Garrison, of Chicago, reported a similar case last year, in which he replaced the fragment by an open operation, and held it in position by the use of a few "periosteal sutures." His patient obtained an excellent result with full range of movement without pain nine months after the original injury.

#### FRACTURES OF THE TIBIAL TUBEROSITIES.

There were twenty-six cases in this group; twelve were males and fourteen females. The average age was 52 years—much older than in the other two groups. The youngest was 45, and the oldest 65 years.

In practically every series reported, fractures of the external tuberosity constituted by far the greatest proportion of the cases. In this series, nineteen (seventy-three per cent.) were fractures of the external tuberosity, six of the internal tuberosity, and one was of both tuberosities.

In fifty-three per cent. of the external tuberosity fractures there was some form of associated injury to the upper end of the fibula, as follows :—

Eight cases of fractured neck of fibula.

One case of fractured head of fibula.

One case of dislocation of the superior tibio-fibular joint.

By the aid of X-rays these tuberosity fractures can be classified according to the following simple scheme :—

1. *Depressed Fractures*.—Seventeen cases, or sixty-five per cent.—these can be subdivided into two groups :—

(a) Simple depressed, i.e., where the tuberosity has been displaced mainly in a downward direction (six cases).

(b) Depressed and comminuted, i.e., where the depressed tuberosity has been crushed into several small pieces (eleven cases).

2. *Non-depressed Fractures*.—Nine cases or thirty-four per cent.—these again can be subdivided into :—

(a) Spreading fracture, i.e., where the tuberosity has been displaced, mainly in a lateral direction (five cases).

(b) Chip or sheer-off fracture, i.e., where a small piece of bone has been detached from the edge of the tuberosity (four cases, and all lateral tuberosity).

Every case had an associated hæmarthrosis; the average amount of bloody fluid aspirated from the joint on the first attempt was sixty c.c.

Following aspiration of the knee-joint and injection of novocaine into it, the most characteristic finding in these cases was lateral instability of the joint associated with valgus deviation in cases of lateral tuberosity fracture, and varus in those in which the medial tuberosity had been broken.

The treatment employed was as follows :—

1. Aspiration of the hæmarthrosis, repeated several times if necessary.

2. Axis traction of the limb on a Thomas' splint for a period of seven to ten days. This allows the swelling around the fracture to subside, and also helps to correct the valgus or varus deformity of the joint.

3. As soon as the swelling had disappeared, the tibial head was strongly compressed by the application of Bohler's "redresseur" in an attempt to mould the tibial plateau so as to produce a joint surface congruous with the corresponding femoral condyle. Great care must be exercised, in the use of the redresseur, to avoid injury to soft parts, especially the common peroneal nerve—in one case in the present series this nerve was injured.

4. A well-fitting plaster cast was then applied, forcing the knee into the maximum varus position in lateral tuberosity cases; in medial tuberosity cases the maximum valgus position was aimed at. The cast was always padded on the outer side of

the ankle, the inner side of the knee, and the outer side of the thigh—in lateral tuberosity cases. In medial tuberosity cases the reverse parts were padded. The cast extended from the upper third of the thigh to the toes.

5. The limb was immobilised in this plaster for twelve weeks, and following its removal an elastic knee-support was worn for a period of six months.

6. In depressed fractures (group 1) this non-operative line of treatment never seemed to produce any appreciable change in the X-ray appearance of the fractured tuberosity, and so in them a steel pin was inserted below the fractured area, having first removed a window in the plaster over the affected part. By using the pin as a lever, an attempt was made to prise the depressed bone upwards into its normal position.

In following up this short series of twenty-six cases, it is evident that very unsatisfactory results have been obtained, and in ten only could a good result be claimed. In these ten cases there was little or no disablement, the patients could walk well and without pain, there was no valgus or varus deformity of the knee-joint, and they were all able to return to their previous normal occupation.

In sixty per cent, therefore, of tuberosity fractures treated in a conservative manner, bad results were seen.

I have examined carefully the follow-up X-rays of these cases, from the time of the commencement of their treatment until their discharge from the fracture clinic, and there is little doubt that good results only occurred in those cases in which the reduction of the fracture led to the re-formation of a proper tibial articular plateau. A plateau incongruous with the femoral condyle invariably was associated with genu valgum or varum and lateral instability of the knee-joint.

In the earlier cases, particularly where there was marked comminution, subsequent X-rays showed that much less correction resulted from the redresseur pressure than one had felt confident had been accomplished. In this connection it was also evident that tuberosities, insufficiently elevated during the early stages of treatment, appeared in four to six months' time more depressed than originally. Patchy sclerosis throughout the bone was in these cases also a feature, and probably was due to the reaction set up by the presence, in the cancellous bone, of the cracked and crushed-in articular cartilage.

In the bad-result cases of this series the following complications were seen:—

1. Instability of the knee-joint with subsequent osteo-arthritis.
2. Meta-traumatic oedema.
3. Recurrent attacks of "synovitis."
4. Common peroneal nerve paralysis.

Whilst Eliason and Ebeling, Forrester and Cotton and Berg, and others have strongly advocated non-operative treatment, everyone must agree that a good anatomic restoration of the tibial articular plateau is of prime importance, provided this can be carried out without undue trauma to the surrounding structures.

The present series indicates that whilst non-operative treatment will give good results in the non-depressed group of cases (group 2), some efficient operative

method for the elevation of the depressed part in group 1 types is absolutely essential.

The method of elevation employed by Bohler did not, in this series, give satisfaction.

Dickson, of Cleveland, has described an operative approach to the whole problem, which in his hands has produced markedly improved results. He elevates each little depressed portion of the tuberosity by using a special dull, flat periosteal elevator, and pays special attention to the crushed-in articular cartilage, so that the contour of the whole tuberosity is re-established. He states that this is by no means as easy as it sounds, and restoring a smooth plateau requires meticulous care and patience. The defect underneath the cartilage after elevation is filled in with small bone chips and cancellous tissue obtained from the tibia at a lower level.

Kindersley described a method in which he compressed the tibial head by encircling it with a plain rubber bandage, each successive turn being made tighter than the one before. He then struck the bandaged area with a heavy mallet in order to "shake" the fragments into position, and thus allow the circular compressive force of the bandage to impact the fracture. This method would appear to have a place in the treatment of the spreading types of fracture (group 2a), but it is very doubtful just how it would be of use in the depressed and comminuted varieties.

#### SUMMARY.

1. A short series of fractures of the upper end of the tibia is analysed, with special reference to the "bumper injury," and the results obtained from conservative treatment.

2. Fractures of the inter-condylic eminence, of the tibial tubercle, and non-depressed fractures of the tuberosities, may be expected to give good results with non-operative methods of treatment.

3. Depressed fractures of the tuberosities, especially if comminuted, should be operated on and some mechanical form of elevation, of the depressed tuberosity and especially of the articular cartilage, carried out.

Non-operative treatment of this type in the present series has given very bad results indeed.

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